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WHAT IS THE IMPACT OF PROFESSIONAL NURSING ON PATIENTS' OUTCOMES GLOBALLY? AN OVERVIEW OF RESEARCH EVIDENCE

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ABSTRACT

BACKGROUND

Nursing is an integral part of all healthcare services, and has the potential of having a wide and enduring impact on health outcomes for a global ageing population. Over time nurses have developed new roles and assumed greater responsibilities. It is increasingly important to demonstrate the safety and overall impact of nurses' practice through research, to support the case for greater investment and development of nursing services around the world.

OBJECTIVE

To provide an overview of existing research evidence on the impact of nursing on patient outcomes, identify gaps in evidence, and point to future priorities for global research. Specifically to address two questions: what is the evidence that nursing contributes to improving the health and well-being of populations?; and where should research activity be focused to strengthen the evidence base for the impact of nursing?

METHODS

A search of the literature from 1996 using CINAHL, MEDLINE, the Cochrane Library, Google Scholar and the NICE evidence databases using the key words: nursing, nurse led, nursing interventions and patient outcomes. Initial analysis of the retrieved citations to reveal clusters of evidence of nursing impact in clinical areas which had been subject to systematic/integrative reviews or meta-analyses. Further analysis of these reviews to provide an overview of the research evidence for nurses' contributions to healthcare to inform discussion on future research agendas. We use the terms low, moderate and high quality evidence to reflect the assessments made by the review authors whose work is presented throughout.

RESULTS

Analysis of 61 reviews, including ten Cochrane reviews and two scoping/selective reviews to provide a summary of the research evidence for

nurses' contributions to healthcare in the following areas of practice: nursing in acute care settings; nurses' involvement in public health; the contribution of specialist nurse and nurse-led services to the management of chronic disease; comparison of care provided by nurses and doctors; and task shifting to invasive procedures.

CONCLUSIONS

There is evidence that adequate numbers of well-educated nurses working in acute care areas can reduce the risk of patient mortality, although the evidence for this is confined to studies in high income countries and the evidence is not sufficiently robust to draw up definitive nurse: patient ratios. There is also moderate evidence that well trained nurses can produce health outcomes that are equivalent to those of doctors for patients with a range of chronic health problems, particularly for those patients managed in primary care, and that nurse-led care may be more effective than medical care in promoting patient adherence to treatment and patient satisfaction. There is low to moderate evidence for the benefits of parenting support programmes delivered by nurses on a range of health outcomes; and for the impact of home visiting on improving function and other health service outcomes for older people.

The wider societal benefits of home visiting by nurses and the impact of this on long term outcomes and related cost-effectiveness of home visiting has not been established. There is limited available information regarding the wider global impact of increasing the numbers of nurses and their contribution to healthcare through improved education. Moreover is very little evidence for the cost-effectiveness of changing care providers from doctors to nurses and as the majority of cost data available has tended to come from studies based in higher income countries, their external validity in terms of applicability to settings in low and middle income countries is questionable. In addition to effectiveness, cost and safety, future research needs to address how implementing expanded nursing roles and task shifting impacts on the morale, retention, and professional development of nurses and the other workforces, and the longer term implications of these developments both locally and internationally.

KEYWORDS

Nursing; Nurse Led; Nursing interventions; Patient outcomes; Impact; Overview.

What is already known about the topic?

- Nurses are the largest professional healthcare workforce and maximising their contribution to health is essential to achieve health coverage for a global ageing population.

- Robust evidence is needed to inform practice and to support the case for greater investment and development of nursing services around the world.

What this paper adds

- Provides a summary of clusters of research evidence of nursing impact in clinical areas which have been subject to systematic/integrative reviews or meta-analyses.

Identifies outcomes that future research studies of expanded nursing roles and task shifting should consider.

INTRODUCTION

Nurses are the largest professional healthcare workforce and maximising their contribution to health is essential to achieve health coverage for a global ageing population (1). Often as first-line carers, nurses play an essential part in increasing patient access to safe care, whilst improving the lives of vulnerable communities through education. .

Over time nurses have developed new roles and assumed greater responsibilities, with the emergence of advanced practice nursing roles, such as nurse practitioners, clinical nurse specialists and consultant nurses, a trend which has accelerated since the 1980s. Nursing is an integral part of all healthcare services, and has the potential of having a wide and enduring impact. To do this, substantial workforce investment is required and nursing leadership needs to be supported at all levels to influence policy locally and internationally (2, 3). As the role of nursing develops, it is increasingly important to demonstrate the safety and overall impact of nurses' practice through research. Robust evidence is needed to inform practice and to support the case for greater investment and development of nursing services around the world.

This paper provides an overview of existing research evidence on the impact of nursing on patient outcomes, identifies gaps in evidence, and points to future priorities for global research. It summarises the extent to which research supports the deployment of nurses in expanded roles across a range of settings, where they have primary responsibility for patient diagnosis, treatment and management, either in collaboration with or substituting for medical staff.

METHODS

This research review aims to answer two questions:

1. What is the evidence that nursing contributes to improving the health and well-being of populations?
2. Where should research activity be focused to strengthen the evidence base for the impact of nursing?

A search of the literature from 1996 to the present was conducted using CINAHL, MEDLINE, the Cochrane Library, Google Scholar and the NICE evidence databases using the key words: nursing, nurse led, nursing interventions and patient outcomes. This initial search yielded over 20,000 individual studies, discussion papers and reviews plus grey literature, which for the most part reported low quality evidence on nursing impact.

Given the wide range of health services which involve nurses, we were necessarily limited in the scope of our review. Initial analysis of the retrieved citations revealed clusters of evidence of nursing impact in clinical areas which had been subject to systematic/integrative reviews or meta-analyses. Our focus was therefore narrowed to include these areas of practice where evidence of nursing impact has accumulated through systematic reviews and meta-analyses. Where possible the results of Cochrane systematic reviews were included as the gold standard, although few of these shed light on the contribution of nursing *per se* to many patient outcomes. In research based in high income countries, reviews were subsequently restricted to those able to provide evidence for the impact of nurses specifically, where the clinical outcomes were sensitive to nursing care, or where the nursing role was principal to successful disease management.

The final summary included evidence from 61 reviews, including ten Cochrane reviews and two scoping/selective reviews. As in a scoping review, the scientific rigour of individual reviews were not subject to quality review. In addition, only English Language publications were included.

The length, and thus the breadth and focus of this research overview means that it is not exhaustive, in that it was not possible to include every relevant review retrieved. In addition, the review is limited to physical care, with mental health nursing interventions excluded. Nevertheless, the paper provides an overview of the research evidence for nurses' contributions to healthcare to inform discussion on future research agendas. We use the term high and middle to low income countries as defined by the original reviews. We use the terms low, moderate and high quality evidence to reflect the assessments made by the review authors whose work is presented throughout.

NURSING IN ACUTE CARE SETTINGS

Within acute care, pinpointing the impact that routine nursing care has on patient outcomes has been facilitated by the development of outcome indicators which are considered most sensitive to nursing input (e.g. pressure sores or falls). In addition, a process indicator of nursing and of patient safety, which is potentially more sensitive than patient outcome measures, is the concept "failure to rescue." Failure to rescue refers to the failure of nurses to observe and intervene to prevent an avoidable complication leading to a patient's death, or a serious deterioration that may lead to an extended hospital stay (4).

The education of nurses has been repeatedly associated with the safety and quality of care in acute care. For example, employing better educated nurses appears to make a substantial positive impact on patient outcomes, patient experience and hospital costs. A single meta-analysis of association between nursing education and patient outcomes (mortality and failure to rescue) reported that a 10% increase in the number of nurses with a university degree could help 1 per thousand patients avoid death, and a 10% increase in the number of nurses with a higher degree could reduce the odds of failure to rescue by 5% (5). Only a few studies were entered into the meta-analysis due to differences in study methods, design and outcome measurement, with the large and now well-known observational studies by Aiken's team influencing the majority of the results (6-8).

In addition, we know that nurses can have greatest impact when there are sufficient numbers of them to effectively care for patients. As the number of nurses per patient decreases, patient outcomes worsen. Systematic reviews of observational studies conducted in acute care sectors in the USA, Asia, the UK and other European countries indicates that higher patient-to-nurse staffing ratios are associated with higher rates of patient mortality (9-11). High levels of nurse staffing are also associated with a decrease in the frequency of avoidable complications in acute wards such as pressure ulcers and urinary tract infections (12) and of complications such as infection, mortality, postoperative complications in critical care wards (13). These findings have implications for both patient health outcomes and wider economic and social costs. An economic synthesis of professional nursing (14) calculated that increasing the number of registered nurses per patient had an estimated value of US$60,000 annually in reduced medical costs and improved national productivity (accounting for 72% of labour costs).

In addition, the added contribution of nurses to the acute care sector is visible through the work of nurse practitioners or advanced nurse practitioners, defined as registered nurses who have acquired expert knowledge and skills in a particular practice area. Although the advanced nurse practitioner role originated to support patients within primary care, the role has expanded to acute healthcare settings, in particular within emergency and critical care. In such areas where patients are often seriously ill, nurses can potentially increase the speed at which patients receive treatment, and can improve continuity of care and the patient experience. Several reviews (15,16,17,18,19) have considered studies comparing services led by advanced practice nurses to physician led care or to usual care in emergency and critical care settings. All reviews have reported improvements in quality of care and patient outcomes including time to treatment, mortality and also greater patient satisfaction when compared to treatment by physicians. A few included studies reported that when advanced nurse practitioners were added to the emergency team, there were overall cost savings. But given the paucity and low quality of available data conclusions on cost effectiveness are largely inconsistent across reviews. Eleven studies included in these reviews were conducted only in high income countries.

Research limitations

Although the findings on acute nurse staffing are compelling, and fuel the argument for better staffing of wards, the majority of the research studies investigating nurse staffing levels and education in acute care are observational which limits the strength of the

evidence. There is also little in the way of cost effectiveness data to inform the calculation of optimum levels of staffing across different settings (20). For example, in acute settings, greater numbers of nurses mean higher salary costs, although these can be partially offset by reductions in adverse events and lengths of stay. A Cochrane review of effective nurse staffing models and patient outcomes found little high quality data to inform their review, with no high quality studies from low or middle income countries eligible for inclusion (21). Research limitations mean that it is largely unknown how increasing nurse numbers, or better educating nurses may impact desperately understaffed hospital wards in very deprived or rural areas.

NURSES INVOLVEMENT IN PUBLIC HEALTH

As patient care continues to shift from acute care to rehabilitation centres, home-based care and community services, nurses are taking primary responsibility for disease management, and maintain the health of populations by encouraging patients to connect with appropriate services. The breadth of the nursing role means that nurses are widely perceived as having an important role to play in health promotion. Health promotion can have a significant impact on the health of populations, increasing the level of control that people have over their health. The major health benefits of increasing vaccination coverage, improving hygiene practices, and promoting good nutrition and exercise are well established, and nurses play an important role in these areas.

Health promotion

Nurses as members of health and social care teams provide community based public health services, and provide individualised care for patients with highly complex health needs (22). There is moderate evidence from reviews to suggest that lifestyle interventions for weight change, blood pressure, cholesterol, dietary and physical activity delivered by primary care nurses, with appropriate training, is comparable to delivery by other primary healthcare professionals (including doctors) with no adverse effects (23). A number of reviews on the safety and effectiveness of nurse delivered interventions in this area concur (24-26). A Cochrane review also found reasonable evidence of the benefits of nurse-delivered smoking cessation programmes compared with usual care, and that longer interventions with specialist health promotion nurses were most effective (27). A meta-analysis also found moderate evidence that nurse led interventions compared to doctor led care were more successful at controlling hypertension through clinical protocol/algorithms, although much of this work comes from the US and good quality research based in the UK is still lacking (28).

Trials of nurse-led weight management in primary care (e.g. through either one to one support or group settings) have shown only limited weight changes compared to other settings (29) (e.g. commercial weight loss programmes or dieticians) but a recent review and meta-analysis using a range of study designs found moderate evidence for the impact of school nurses in reducing the body mass index (BMI) of obese school children, and thus their risk of type 2 diabetes (30). This supported previous reviews which had also found nursing interventions for improved weight management in schools to be effective (31, 32).

Vaccinations and hygiene

Vaccination has greatly reduced the burden of infectious diseases. A simple vaccination can prevent mortality and morbidity across high and also low and middle income countries and across the lifespan. In addition, through reducing medical costs and increasing productivity, savings from vaccines are thought to be in the order of tens of billions of US dollars of direct savings.

The burden of communicable diseases is highest in low and middle income countries, hence the importance of programmes of immunizations in this areas. However, despite the drive to improve vaccination coverage, there is only low to moderate evidence to inform policy and decision making. One meta-analysis of strategies to improve vaccination uptake in high income countries suggests that when responsibility is switched to non-physician health care professionals, especially nurses, a 44 percent increase in influenza vaccination rates is seen (33). The key appears to be the ability of the nurse to reassure and educate people about vaccination.

A recent Cochrane review of strategies to improve coverage concluded that it is unlikely that one approach to improving uptake will meet the needs of individual countries, and that the development of local initiatives to tackle complex but specific community barriers to vaccine uptake is likely to be necessary (34). Personal contact with professionals, who can provide and discuss vaccination at home or at community centres, may support uptake. Nurses, often embedded in the community, are therefore well placed to play an important role in developing these initiatives and to promote people's uptake of vaccines for diseases such as rotavirus and measles (35).

Outreach and home visiting

Hospital care is extremely expensive, and nurses, through home visiting, transitional care, and outreach services, enable vulnerable people to be treated in their own home. In addition to the benefits for patients, home visiting by nurses has the potential to reduce functional decline and mortality in older populations, and reduce the need for admission to hospital care or long-term institutional care.

Currently results on the impact of home visiting in high income countries appears inconsistent, with some reviews finding no clear evidence of effectiveness (36, 37) and others suggesting that visits which are multiple, use validated multidimensional assessments and target younger geriatric populations, may decrease mortality rates, delay functional decline and improve well-being (38,39). Existing reviews do concur that the greatest benefits are seen when visiting older people who are less unwell (e.g. population with mortality rates less than 6%) (37). There is moderate evidence therefore that home visiting can improve morbidity rates in at risk older people, and delay the need for long term care, but currently there is insufficient data on its impact on hospital admission rates.

Minority communities and vulnerable populations, often from rural areas, rely on public health nursing to increase their access to services and health. A large review of the effectiveness of health visitors (i.e. qualified nurses or midwives with post-registration experience who have undertaken further training and qualifications in child health, health promotion, public health and education and visit families at home)., found moderate evidence for beneficial outcomes in breastfeeding rates, detection of post-natal depression, reduction on unintentional injury and improvements in the

intellectual development of low birth weight infants. The review reported insufficient evidence to show the impact of health visitors on longer term outcomes such as child health and diet, mother's health and return to work, future family planning or child neglect (40).

One review of largely US programmes (41) found that sending trained nurses to high risk families to directly address problems of prenatal health, child development and economic issues, had the greatest evidence of effectiveness. There is also some evidence that nurses were highly valued by parents and that families receiving care from nurses were less likely to drop out of treatment than when similar intervention programmes were delivered by paraprofessionals. Given the difficulty with parental engagement in this area, this was an important finding. However, cost-effectiveness data were scarce. In addition, a later review of parenting interventions (42) found inconsistent evidence for the benefits of early family intervention (0-2 years).

Research limitations

The nurse's role in promoting sanitation, nutrition and general hygiene in countries where mortality from diarrhoeal diseases is high, is particularly important. Key mechanisms to reduce the incidence of communicable disease are handwashing and breast feeding. Handwashing can help to control epidemics such as cholera and dysentery.. There is good evidence from a Cochrane review that handwashing promotion in both high income countries and low and middle income countries may reduce the incidence of diarrhoea by about 30% (43). However, less is known about how best nurses can promote hand washing and help people maintain hand washing habits in the long term. Given that we have many of the tools already required to address poor health outcomes, more research is needed on improving our understanding of how to implement interventions, and how nurses can play a key role in their effective delivery.

Overall there is low to moderate evidence that nurses/midwives and other health professionals can increase the likelihood of breastfeeding compared with usual care, through supportive counselling and education with new mothers (44, 45). However more generally there is inconsistent evidence across higher income countries, mainly in the US, of the benefits of home visits by nurses (or health visitors) on maternal and child health outcomes, and their contribution to early intervention programmes. This does not mean that this form of outreach is ineffective, but that there is insufficient evidence to form firm conclusions. In addition, the difficulty of capturing the long term outcomes for these types of interventions in terms of the family's long term health, lifetime productivity and social integration means that the true impact of this work may be grossly underestimated.

THE CONTRIBUTION OF SPECIALIST NURSE AND NURSE-LED SERVICES TO THE MANAGEMENT OF CHRONIC DISEASE

Effective primary healthcare is the frontline management of chronic diseases, greatly reducing the need for hospitalisation to treat complications arising from chronic ill health. The role of nurses and their scope of practice has continually evolved largely in response to staffing shortages, particularly within primary care (46). With increasingly fluid boundaries between the clinical duties of healthcare staff, nurses with advanced skills are taking prime responsibility for the management of patients with chronic health

difficulties in higher income countries, where the burden of chronic illness is particularly heavy.

Nurse led care clinics

When chronic conditions are managed in an outpatient setting using clinical protocols, evidence suggests that specialist primary care nurses provide safe, effective care, and have a positive impact on the health outcomes of adults with chronic conditions.

Specific nursing interventions for secondary prevention in patients with chronic airways disease and/or heart failure have a significant positive impact on reducing blood pressure, reducing lipids, increasing physical activity, reducing dietary intake, reducing cigarette smoking, weight loss, reducing healthcare utilization, reducing mortality, increasing quality of life, and improving psychosocial outcomes (47-49). Evidence suggests that nurse-led clinics for patients with cardiac disease are also effective at reducing morbidity and mortality rates, and reducing the frequency of cardiac events compared to usual care (50). A Cochrane review found nurse-led titration of heart failure drugs (beta-adrenergic blocking agents) was more effective at optimising dose and reducing hospitalisation than physician led primary care (51); and there is also some evidence for successful outcomes for nurse-led clinics for patients with Rheumatoid Arthritis (52). Nurse led clinics are common in high income countries for many groups of patients with long term health difficulties, ranging from inflammatory bowel disease to osteoarthritis; and although some have been subject to evaluation, there is currently less robust evidence available in terms of reviews for the overall effectiveness of these clinics.

Education and self-management

Often as part of disease management, nurses will provide patient education to support patient self-management. Self-management aims to increase patients' knowledge and skill at managing their own condition, in order to try and improve or maintain their health status and quality of life. Reviews of nurse-led self-management interventions compared to usual care have found low to moderate evidence of positive impact on diseases which can benefit most from good patient self-management (53, 54). For example, diabetes through beneficial changes in blood glucose (HBA1c) and cardiovascular disease through the reduction of cardiovascular risk factors.
Evidence suggests that the impact of interventions promoting self-management may be particularly significant for people with poorly controlled diabetes (55). Another area where nurses are heavily involved is in the management of patients with chronic obstructive pulmonary disease (COPD); a review of nurse-led self-management in COPD (56) found some evidence that interventions reduced patient anxiety and physician visits, but little evidence of other clinical or cost benefit outcomes. A Cochrane review of a small number of good quality studies comparing specialist nurse-led asthma care compared with physician led care found no significant difference on clinical outcomes (57). Although there is little robust evidence to determine which professionals should be delivering self-management education and support (58), a synthesis of quantitative and qualitative data of patients' experience of self-management found some evidence to suggest that, when given the choice, patients were more likely to contact a nurse (than a doctor) regarding their self-management care (59).

Nurses who have prescribing qualifications are able to prescribe a range of different medicines, which assist them with the holistic management of chronic disease in primary and secondary care. The safety of nurse prescribing is paramount. A review of nurse prescribing in primary care found little evidence in terms of clinical outcomes to determine its safety, although patients reported an increased understanding of their care with nurse prescribing (60). A recent Cochrane review of non-medical prescribing versus medical prescribing for acute and chronic disease management in primary and secondary care (61) found low to moderate evidence that non-medical prescribers (including both nurses and pharmacists) can deliver comparable outcomes for systolic blood pressure, glycated haemoglobin, low-density lipoprotein, medication adherence in primary care settings, patient satisfaction, and health-related quality of life, although evidence was not available to compare the frequency of adverse events between non-medical and medical prescribers.

COMPARISON OF CARE PROVIDED BY NURSES AND DOCTORS

Appropriately, there has been a substantial amount of research conducted to determine whether the care that nurses provide is as safe and provides equally good patient health outcomes as doctor led care. We have good evidence overall from research in high income and some evidence in low and middle income countries that advanced and specialist nurses are as safe as physicians in treating patients with chronic diseases, and are as effective as or more effective than doctors in primary care management.

A Cochrane review (62) found that nurse practitioners, clinical nurse specialists and health visitors provided care comparable to that of physicians across primary care, with similar outcomes over the short term, and a positive effect on patient satisfaction in favour of the nurse. A more up to date review and meta-analysis of nurse practitioner care across general practices and nurse led clinics, including low to moderate quality trials, found that nurse led care was not significantly different to physician led care in 84% of the patient outcomes reported. The remaining 16% significantly favoured nurse-led care compared to physician-led care (63). This supports findings from previous meta-analyses which have also found that the care delivered by nurses for people with chronic conditions was as least as effective as care given by doctors (64, 65). No differences have been found in the outcomes of: repeat consultation, physical function, attendance of follow-up visit, or attendance at emergency departments after receiving care. Moreover, patient satisfaction was significantly higher with care delivered by nurses compared to doctors.

In addition, although nurse practitioners appear to order more investigations than doctors, they are comparable in their use of prescriptions (63-65). A recent review and meta-analysis (66) including all research designs for the World Health Organisation found evidence that the care provided by nurses was as effective as that provided by doctors in high and low and middle income countries for chronic conditions such as diabetes mellitus and hypertension. However, the authors report that the research was often of low quality.

The measurement of the impact of nurse led care on outcomes in low and middle income countries in very deprived environments may not always be practical given the complexity of patient cases, and so proving safe adherence to protocol may be a good beginning to show the safety of nurses and other professionals who are taking on new roles (67).

Exemplars of this include a recent large analysis of relevant clinic data in Sub-Saharan Africa, which reported that when properly trained, nursing care of people with five stable chronic diseases (i.e. hypertension, diabetes mellitus type 2, epilepsy, asthma, and sickle cell disease) was safe and that nurses were able to follow clinical protocols successfully (68). A review (69) also reported, using low grade evidence, that care delivered by nurses appeared to be as effective as care given by doctors, and that satisfaction with non-medical staff (especially midwives) was often higher.

One review of observational studies and randomised controlled trials of shifting the management of non-communicable disease in low and middle income countries largely to nurses but also to other non-medical workers, reported that non-physician healthcare workers could successfully screen for coronary heath disease, epilepsy, depression and diabetes, and that when given responsibility for medication management, could treat safely according to protocols. There was more limited evidence of improvements in disease outcomes (70). A Cochrane review of shifting the provision of antiretroviral therapy found strong to moderate evidence that there was no difference in the quality of care provided by doctors and by non-medical personnel, most of whom were nurses (71). An additional review (72) found moderate evidence from published and unpublished studies that shifting HIV care to nurses and other non-physicians offered a high-quality, cost-effective alternative for patients. Typically waiting times and clinic costs reduce in programmes where nurses manage uncomplicated HIV care.

Research limitations

From the research evidence available, it appears there is little difference between nurses and physicians in terms of patient health outcomes in primary care in both lower and higher income countries, when nurses are appropriately trained and supervised where necessary. However, where nurses seem to provide added value is in terms of patient satisfaction with care, and there is some evidence that they can enhance patients' adherence to treatment more effectively than physicians. Nurse consultations can often last significantly longer and involve greater discussion between patient and clinician (73) which may support the development of important therapeutic relationships.

Much of the research on chronic disease management is restricted to short term outcomes for patients in primary care, and thus the impact of chronic disease management on infrequent but serious adverse complications is often undetectable. For longer term evaluation, sensitive and meaningful outcomes which are appropriate for progressive chronic conditions are needed, as simple reductions in service utilisation will not always indicate better clinical management, and may result from greater understanding of the health problem by the patient. Equally, although we have good evidence that self-management can improve key outcomes, there is less evidence available for the exact role of nurses in delivering this education, as nurses' contributions can be difficult to pinpoint in relation to other members of the clinical team. There is also a paucity of research looking at how nurses can effectively manage multi-morbid patients, despite the majority of older people having more than one chronic health problem which complicates their health management.

The majority of research studies included in the reviews above used data available from Europe and the US, with far less research available for low income countries. Although these forms of chronic conditions have historically affected high income countries, the

World Health Organisation (WHO) now estimates that around 80% of the mortality attributable to non-communicable diseases occurs in low and middle income countries, with cardiovascular disease accounting for the greatest burden. Service reconfigurations or nurse-led interventions that work within optimal trial settings in high income countries may not be appropriate in low to middle income areas, and their wholesale implementation without testing may be costly and ineffectual in already poorly resourced areas. However, it is a reasonable assumption that nurse led care is cost effective compared to doctors and could substantially increase access to essential care such as HIV interventions.

TASK SHIFTING TO INVASIVE PROCEDURES

In low and middle income countries, nurses' roles are evolving rapidly, not just as specialist nurses but also as surgical assistants or clinical associates, performing specific surgical and medical procedures. This occurs largely because of the lack of available medically trained staff. This process of task-shifting, which WHO defines as "the rational redistribution of tasks among health workforce teams" involves the transfer of duties to a nurse, or another person trained to do a specific job sometimes without any formal healthcare education at all. Task shifting to mid-level health workers, which includes nurses, is attractive as they are less costly to train and easier to retain in rural areas where health needs are often greatest.

Recent reviews have found a high prevalence of task shifting for a range of surgical procedures, particularly in low and middle income countries (74, 75). There is some evidence in the form of recent reviews of low quality evidence to suggest that task shifting from doctors to other personnel (including nurses) does not increase adverse events in male circumcision (76) and contraception devices and vasectomies (77). However, there is little in the way of robust data to determine the safety or clinical outcomes of redistributing roles away from doctors and research is not available to compare the effectiveness and safety of nursing staff performing these duties compared to other types of non-physician healthcare workers

Survey data on task shifting suggested that in low and middle income countries many surgical and anaesthetic procedures performed by mid-level workers were unsupervised, compared to high income countries where almost all were supervised in some way (over 90%) (74) .Given that resources are scarce and opportunities for supervision are limited, it is of course important that workers, including nurses, receive the appropriate training to practise safely and so protect themselves and their patients. In addition, just as many of these mid-level health workers will be nurses taking on the roles previously occupied by doctors, there also will be community workers and lay people taking on duties previously performed by nurses, and the evaluation and safety of these role substitutions is equally important.

SUMMARY AND CONCLUSIONS

Limitations of the paper

This overview of the research evidence has focussed on selected key areas of practice and does not purport to cover every area of healthcare where nurses are playing a key

role. For example, a noticeable absence from this review is the evidence of nurses' impact on mental health, where nurses support vulnerable people to stay well, allowing them to remain socially integrated and to contribute to the workforce. A further limitation of this paper is that by presenting only best evidence through drawing on meta-analysis and high quality reviews, we are not able to reflect fledgling evaluations which are being conducted across the world, and particularly in low and middle income countries. These studies demand consideration, as although they do not reach the standards of evidence to be included in reviews, they can provide valuable information on intervention design, and more importantly, on their implementation and delivery.

Conclusions

In light of the evidence, optimal deployment of staff in any healthcare system, whether in high or in low and middle income countries, should ensure that care and treatment is delivered at every point in the patient's journey by a healthcare worker working to the maximum limit of their education, experience and competence who has the appropriate level of capabilities and skills to deliver safe care. It follows that scare healthcare resources should be distributed on the basis of professional accomplishments rather than historical workforce hierarchies and roles, a trend which is reinforced by the growth of patient-centred care which demands increased flexibility in working practices and service organisation. Nurses are certainly proving themselves to be effective in a variety of roles across the lifespan and disease trajectory. Whilst we can be cautiously confident that their care is as effective as doctors in areas where they are appropriately trained, we have less information available regarding the wider global impact of increasing the numbers of nurses and their contribution to healthcare through improved education.

There is evidence that adequate numbers of well-educated nurses working in acute care areas can reduce the risk of patient mortality, although the evidence for this is confined to studies in high income countries and the evidence is not sufficiently robust to draw up definitive nurse: patient ratios. There is also moderate evidence that well trained nurses can produce health outcomes that are equivalent to those of doctors for patients with a range of chronic health problems, particularly for those patients managed in primary care, and that nurse-led care may be more effective than medical care in promoting patient adherence to treatment and patient satisfaction. In fact, nurses appear to add value in terms of patient satisfaction and are able to create therapeutic relationships with patients which may further their understanding of, and motivation to self-manage their disease. There is low to moderate evidence for the benefits of parenting support programmes delivered by nurses on a range of health outcomes; and for the impact of home visiting on improving function and other health service outcomes for older people. However, the wider societal benefits of home visiting by nurses and the impact of this on long term outcomes and related cost-effectiveness of home visiting has not been established.

Particularly when resources are scarce, making a convincing business case for further investment in nursing is needed, and for low to middle income countries, the cost of developing new roles and services is even more pressing. To put this strong case, researchers need to show that nurse led services are cost effective as well as clinically effective. However, given that much of the role expansion work has been driven by resource needs and the need to reduce cost, there is still very little evidence for the cost-effectiveness of changing care providers from doctors to nurses. A scoping review (78) found that, although generally nurses provide cost-effective care compared to other

health professionals, the quantity and quality of data was generally low, and the longer-term flow of costs and benefits associated with role substitution were rarely considered by the economic analyses. A more recent review of the quality of economic evaluations of the work of advanced nurse practitioners and specialist nurses, also rated over 70% of them as low quality and reported the failure of most to use standard outcome measures, such as quality adjusted life years, or to provide comprehensive data on resource utilization costs (79). Future research studies need to go beyond traditional cost-effectiveness analysis. Nurses are less expensive to train and employ than doctors, but they may also take longer and use more resources to provide a similar quality and quantity of care. Substantial supervision from medical staff may be involved and needs to be costed, but this may lessen over time. Similarly long-term beneficial societal effects, such as increased patient productivity, decreased burden on carers and nurse retention also tend to be largely unaccounted for in evaluations. Although such outcomes are challenging to collect, they are necessary to demonstrate the wide reaching impact that nursing interventions can have.

In addition, as the majority of cost data available has tended to come from studies based in higher income countries, their external validity in terms of applicability to settings in low and middle income countries is questionable. Early indications are that task shifting in these countries, involving nurses and other non-medical professionals can produce substantial benefits in terms of delivering services to populations who would have previously been unable to access them. A recent review of low and middle income countries reports promising evidence for role substitution (including nurses) in achieving cost savings and efficiency in diabetes and HIV care, and moderate evidence for savings in the management of malaria, non-communicable diseases and childhood illness, especially at the primary health care and community levels. However, the review did not consider the particular contribution that nurses make as one of the non-medical provider professions (80).

Research in low to middle income areas is still largely formative, with studies focusing on whether nurses are able to safely follow protocols rather than their overall impact on longer term outcomes, or indeed the training and supervision needs of nurses and other professionals involved in task-shifting. Despite the considerable potential for nursing in low to middle income countries, nurse shortages are even more severe than in high income countries, with particular issues concerning geographical migration of nursing staff into cities to work in higher tech hospital environments with superior working conditions. This leaves rural areas which are most in need largely unstaffed by both medical and nursing staff. It can be particularly challenging for nurses who remain working in poorly resourced rural areas where they often feel unsupported. In addition to effectiveness, cost and safety, future research needs to address how implementing these expanded nursing roles and task shifting impacts on the morale, retention, and professional development of nurses and the other workforces, and the longer term implications of these developments both locally and internationally.

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